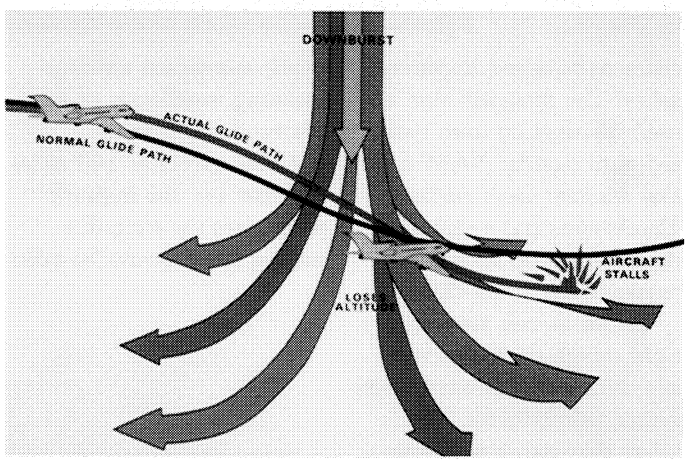
Windshear Prediction

Windshear, microbursts and extreme air turbulence—caused by sudden, intense changes in wind direction or speed—are difficult to detect and thus dangerous to air traffic. They have been positively identified as the cause of 28 aviation accidents that claimed 491 lives.

The downburst, one of several forms of windshear, is illustrated below. A pilot first encounters unexpected lift and he reacts by dropping the nose of the plane. When, a moment later, the full force of the downburst strikes, the downward push is amplified by the fact that the airplane is already descending. The pilot must then react quickly to restore the plane to its proper glide path. At right, a DC-9 airliner is landing shortly after a thunderstorm at Hartsfield International Airport, Atlanta, Georgia. The vapor streaming from the wingtips is the result of high humidity, a factor in windshear.

Many groups are investigating ways to detect and predict windshear. Since windshear episodes are transient, lasting only five to 10 minutes, the goal is an alert system that would enable holding the plane for the brief period it takes for these intense wind abnormalities to pass. Most researchers are looking to electronic sensors as the answer. But Federal Aviation Consulting Services, Ltd. (FACS), Fresh Meadow, New York is going a different route—applying artificial intelligence techniques to windshear prediction. FACS has been working since 1985 to develop a computer program that will automate the airline dispatch process and include windshear information. FACS' artificial intelligence based Airline Dispatcher program is intended as a backup, not a replacement for the human dispatcher. It would incorporate the same data that a human would request to make a decision, and then draw a conclusion using the same rules of logic as the human expert.



In directing the FACS development, company senior vice president Jerry Eichelbaum initially used an artificial intelligence program called AESOP, originally developed by Langley Research Center. As the design evolved, FACS was able to compact its database and replace the AESOP shell with a new artificial intelligence program called CLIPS. Both AESOP and CLIPS were supplied by NASA's Computer Software Management and Information Center. (See page 140).

FACS has signed an agreement with Genesis Imaging Technologies, Inc., Valley Forge, Pennsylvania. They have put together a prototype flight dispatcher based on FACS software and a hardware package that includes a powerful workstation connected to an optical disc information storage device. The computer program puts emphasis on the factors found in every case where windshear was positively identified as the cause of an accident. The data is overlaid on a cartographic mapping program.

Using all information available, the artificial intelligence module sets up a 20-mile sphere of influence around forecasted areas of windshear. As flight plans are filed, the routes are checked against "no fly" areas indicated. The total FACS/Genesis system presents the user with pictorial displays of navigational maps overlaid with flight planning options. Two major airlines are considering test and/or purchase of the system. ▲